LEADING THE QUEST FOR HEALTH™
Cedars-Sinai
Nulliparous Term Singleton Vertex (NTSV): Is Healthy People 2020 Goal Possible?
Kimberly D. Gregory MD, MPH
Vice Chair Women’s Healthcare Quality & Performance Improvement
Department Obstetrics & Gynecology
Cedars Sinai Medical Center
Professor, David Geffen School of Medicine &
UCLA School of Public Health

Disclosures
- No financial disclosures
- No off-label use of medications

Objectives
- Participants will be able to
  - Discuss the different strategies for defining normal and abnormal labor
  - Describe the risks associated with cesarean delivery with an emphasis on nulliparous patients
  - Discuss potential interventions which may help reduce the risk of having the ‘first’ cesarean delivery and impact the NTSV rate

Why is this important?
- Cesarean delivery is the most commonly performed surgical procedure in the United States
- Approximately 1/3 of pregnancies are delivered via cesarean
- In 2010, 26.4% of low risk women underwent a cesarean
  - Low risk = nulliparous, term, singleton, vertex (NTSV)
- Over 90% of women undergoing a primary cesarean in the US will have a repeat cesarean
After the first cesarean...

- Maternal risk for complications increase
- Intraoperative risks
  - Hemorrhage
  - Injury to viscera
  - Bowel
  - Bladder
  - Adhesions

After the first cesarean...

- Risks for abnormal placentation increase
  - Previa
  - Accreta
  - Increta
  - Rercreta
- Risk of uterine rupture increases
  - Fetal/Maternal jeopardy
- With all of these, there is an increased risk for:
  - Hysterectomy
  - Blood transfusion
  - Wound infection/breakdown
  - DVT

Summary

- The decision to undertake the first cesarean has profound implications on a woman’s future reproductive health
- Much of labor management in the US relies on information based on Friedman’s curves (1955)
- Some of these concepts have been challenged
  - Review of key concepts introduced throughout the years regarding labor management

Let’s start with the 1950’s
Historical Background

- Friedman curve 1955
- 500 patients
  - Ages 13-42 (mostly 20-30)
  - SVD in 202 (40.4%)
  - Low forceps in 256 (51.2%)
  - Mid forceps in 19 (3.8%)
  - Cesarean delivery 9 (1.8%)
- Augmentation / induction
  - 69 patients (13.8%) received pitocin
    - 22 for ‘induction’
    - 47 for ‘stimulation’

Friedman Curve

- Focused on looking at rate of cervical dilation
- Recorded all 'rectal' and 'vaginal' exams
- Dilation plotted over time
- Noted features such as age, pelvis type, fetal presentation, fetal station

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Mean</th>
<th>Range</th>
<th>Stat. Max.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Latent phase (hr)</td>
<td>8.6</td>
<td>1.0-44</td>
<td>20.6</td>
</tr>
<tr>
<td>Active phase (hr)</td>
<td>4.9</td>
<td>0.8-34</td>
<td>11.7</td>
</tr>
<tr>
<td>Deceleration (hr)</td>
<td>0.9</td>
<td>0.0-14</td>
<td>3.3</td>
</tr>
<tr>
<td>Max slope (cm/hr)</td>
<td>3.0</td>
<td>0.4-12</td>
<td>6.8</td>
</tr>
<tr>
<td>First stage (hr)</td>
<td>13.3</td>
<td>2.0-58</td>
<td>28.5</td>
</tr>
<tr>
<td>Second stage (hr)</td>
<td>0.95</td>
<td>0.0-5.5</td>
<td>2.5</td>
</tr>
</tbody>
</table>

Friedman 1955


Friedman Curve – ‘Ideal Labor’

‘Primagravidas whose labors progressed normally without iatrogenic tampering.’

### Friedman Curve

- **'Clinical Inertia'**
  - 46 patients
    - Average of 13 hours in latent phase
    - Average of 12.2 hours in active phase
    - Second stage was 1.6 hours
    - Maximum slope was 1.4 cm/hr
  - Primary inertia
    - 21 patients (46%)
  - Secondary inertia
    - 20 patients (43%)
  - Reasons:
    - Excessive medication (46%)
    - CPD (28%)
    - Occiput posterior (28%)
    - Caudal Anesthesia (22%)
    - Unknown

These people didn’t fit his curves!

### On to the 1970’s...

### Alternate Ways to Monitor Labor Progress

- Philpott and Castle (1972)
  - Cervicograph
    - Composed of alert and action lines plotted against time (hours)
  - Partograph

### Cervicograph

- Founded on Friedman’s work
  - Low resource conditions
  - Starts at 3 cm
  - Alert: close observation
  - Action: augment/transfer

Philpott & Castle, J Ob Gyn Brit Comm 1972
On to the 1990s….

WHO Partograph

- Definition of “active phase”
  - Shift from “rate of change” (slope) to specific cm
  - 3 cm

Active Phase Labor Arrest

  - Prospectively studied a labor-management protocol which mandated at least 4 hours of oxytocin prior to cesarean delivery for active phase arrest

Active Phase Arrest

- Term, gravid patients
- Spontaneous labor
- Active phase arrest
  - 4 cm dilated
  - < 1 cm in 2 hours of cervical change
- Excluded:
  - Malpresentation, prior cesarean deliveries, multiple gestation, and nonreassuring fetal heart tracings (NRFHT)
After the diagnosis of active phase arrest, oxytocin was initiated to achieve >200 Mv Units (IUPC)

Cesarean delivery not performed until 4 hours with adequate MVU
—Or a minimum of 6 hours (if adequacy not achieved)

Rouse’s Take Home Point: A little more time...

2 hours may not be enough time for some women to progress in labor
A minimum of 4 hours of oxytocin-augmented labor (adequate Mv units) should be allowed
For women who do not achieve adequate mvu, a minimum of 6 hours of augmentation should be allowed for these patients


Zhang Conclusions

- Labor progress may be more gradual than originally thought (especially for nulliparous patients)
- Women may enter active labor between 3-5 cm dilation
- Even the course of the active phase of labor will vary from person to person
- Friedman’s curve likely represents an individual patient with an ‘ideal’ curve
Recap

- Friedman focused on individual progress, defined active labor based on maximum slope rate of change
- Latent phase could be a long time
- Philpott & Castle, WHO started curves at 3 cm; ignored latent phase and/or early labor
- Zhang nulliparous slower, mimics Friedman after active phase; rate of change occurs around 5 cm
  - Similar population as Friedman; more contemporary cohort
  - Data started at 3 cm

Safe Labor

- Consortium for Safe Labor*
- Large multicenter study
- Contemporary women in spontaneous labor undergoing the 'usual' care may:
  - Take 6 hours to change from 4-5 cm
  - Take more than 3 hours to change from 5-6 cm
  - After that point, labor curve is steeper
- Redefine the starting point of active labor from 4 cm to 6 cm
- Does this mean that Friedman’s results are wrong?

*includes patients from CSMC (2002-2008)

Demographics

<table>
<thead>
<tr>
<th>Safe Labor Consortium 2002-2008</th>
</tr>
</thead>
<tbody>
<tr>
<td>Party 0</td>
</tr>
<tr>
<td>Unweighted cohort (n)</td>
</tr>
<tr>
<td>Weighted cohort (n)</td>
</tr>
<tr>
<td>Maternal race</td>
</tr>
<tr>
<td>White</td>
</tr>
<tr>
<td>African American</td>
</tr>
<tr>
<td>Asian or Pacific Islanders</td>
</tr>
<tr>
<td>Others</td>
</tr>
<tr>
<td>Maternal age (y)</td>
</tr>
<tr>
<td>Body mass index before pregnancy (kg/m²)</td>
</tr>
<tr>
<td>Body mass index at delivery (kg/m²)</td>
</tr>
<tr>
<td>Cervical dilation at admission (cm)</td>
</tr>
<tr>
<td>Effacement at admission (%)</td>
</tr>
<tr>
<td>Station at admission</td>
</tr>
<tr>
<td>Gestation in spontaneous labor</td>
</tr>
<tr>
<td>Induction</td>
</tr>
<tr>
<td>Total number of vaginal examinations in first stage of labor</td>
</tr>
<tr>
<td>Cesarean delivery</td>
</tr>
<tr>
<td>Birth weight (g)</td>
</tr>
</tbody>
</table>

Cervical Exam on Admission

95th percentile of cumulative duration of spontaneous labor from admission to vaginal delivery

Zhang et al. Contemp Labor Patterns Obstet Gynecol 2010
**Duration of Labor Based on Exam on Admission**

<table>
<thead>
<tr>
<th>Cervical Dilation (cm)</th>
<th>Admitted at 2 or 2.5 cm</th>
<th>Admitted at 3 or 3.5 cm</th>
<th>Admitted at 4 or 4.5 cm</th>
<th>Admitted at 5 or 5.5 cm</th>
<th>Total (n=5,272)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Admitted to 3</td>
<td>0.9 (7.7)</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>0.9 (7.7)</td>
</tr>
<tr>
<td>Admitted to 4</td>
<td>3.2 (11.2)</td>
<td>1.9 (6.4)</td>
<td>NA</td>
<td>NA</td>
<td>3.1 (10.9)</td>
</tr>
<tr>
<td>Admitted to 5</td>
<td>5.0 (13.9)</td>
<td>7.9 (11.3)</td>
<td>0.9 (6.5)</td>
<td>NA</td>
<td>5.6 (14.6)</td>
</tr>
<tr>
<td>Admitted to 6</td>
<td>6.0 (15.7)</td>
<td>4.2 (17.3)</td>
<td>2.2 (6.7)</td>
<td>0.6 (6.3)</td>
<td>6.2 (15.6)</td>
</tr>
<tr>
<td>Admitted to 7</td>
<td>6.4 (14.6)</td>
<td>5.0 (13.8)</td>
<td>3.2 (11.4)</td>
<td>1.4 (9.7)</td>
<td>6.5 (14.6)</td>
</tr>
<tr>
<td>Admitted to 8</td>
<td>7.1 (17.5)</td>
<td>5.6 (14.6)</td>
<td>5.9 (13.0)</td>
<td>2.4 (9.6)</td>
<td>7.1 (17.5)</td>
</tr>
<tr>
<td>Admitted to 10</td>
<td>8.4 (24.9)</td>
<td>6.4 (17.7)</td>
<td>6.5 (15.7)</td>
<td>4.5 (14.3)</td>
<td>7.6 (18.3)</td>
</tr>
<tr>
<td>Total</td>
<td>0.9 (7.7)</td>
<td>3.2 (11.2)</td>
<td>5.0 (13.9)</td>
<td>6.0 (15.7)</td>
<td>6.4 (14.6)</td>
</tr>
</tbody>
</table>

Median (95%ile)

Zhang et al. Contemp Labor Patterns. Obstet Gynecol 2010 (modified)

**Duration of Labor by Method of Onset**

- "6 is the new 4"

**Implications**

- If the definition of active labor is shifted to 6 cm —many cesarean deliveries performed prior to that point would be considered “latent phase cesareans”
- Arrest of labor diagnosis prior to 6 cm of cervical dilation needs to be considered carefully
  —Zhang et al
58 years later...the discussion about labor continues...Why is this so important?

US Cesarean Rate On the Rise

- US cesarean delivery rate has risen from 6% to approximately 33% between the mid 1950s until now
  - Based on 2007 data, nearly 27% of low-risk women had a primary cesarean
- Some hospitals have cesarean delivery rates in excess of 50%
- Hospitals with lower cesarean delivery rates of 15-20% have similar outcomes
  - (high rate has no demonstrated benefit to mother or baby)

NSTV

- Cesarean delivery rate for low-risk, nulliparous women
- NSTV = nulliparous, term, singleton, vertex
- Portion of cesarean births which has the most variation
  - Practitioners
  - Hospitals
  - Geographic region
- QI mantra: where there is variation, there is opportunity for improvement

Why are we interested?

- Cesarean delivery has profound effects on a patient’s reproductive life
- Nulliparous women have 4-10 fold increase risk of cesarean deliveries compared to multiparous women
- At least two obstetric practices have been identified which have significant impact on the labor of nulliparous patients:
  - Induction of labor
  - Early labor admission
What changed between then (50 years ago) and now?

**Then**
- Friedman’s Curve

**Now**
- Zhang et al

---

**Maternal Characteristics**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Then</th>
<th>Now</th>
<th>Adjusted P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maternal age, y (mean ± SD)</td>
<td>29.4 ± 4.9</td>
<td>29.4 ± 4.9</td>
<td>&lt; .001</td>
</tr>
<tr>
<td>Delivery BMI, kg/m²</td>
<td>25.5 ± 3.4</td>
<td>25.6 ± 4.9</td>
<td>&lt; .001</td>
</tr>
<tr>
<td>Admission characteristics</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gestational age at delivery, wks</td>
<td>39.3 ± 2.4</td>
<td>38.6 ± 2.4</td>
<td>&lt; .001</td>
</tr>
<tr>
<td>Obstetric on admission</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Median (10th, 90th percentile)</td>
<td>3.1 (1, 6.5)</td>
<td>3.5 (1, 7)</td>
<td>&lt; .001</td>
</tr>
<tr>
<td>Mean ± SD</td>
<td>2.5 ± 2.0</td>
<td>2.8 ± 2.3</td>
<td>&lt; .001</td>
</tr>
<tr>
<td>Rate on admission</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Median (10th, 90th percentile)</td>
<td>80 (40, 100)</td>
<td>80 (30, 100)</td>
<td>&lt; .001</td>
</tr>
<tr>
<td>Mean ± SD</td>
<td>77 ± 26</td>
<td>84 ± 18</td>
<td>&lt; .001</td>
</tr>
<tr>
<td>Spontaneous ROM prior to admission</td>
<td>16.0</td>
<td>41.0</td>
<td>&lt; .001</td>
</tr>
</tbody>
</table>


---

**Labor Characteristics**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Then</th>
<th>Now</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Expected, %</td>
<td>100</td>
<td>100</td>
<td>&lt; .001</td>
</tr>
<tr>
<td>Maternal obesity, %</td>
<td>4</td>
<td>2</td>
<td>&lt; .001</td>
</tr>
<tr>
<td>Hypertensive disease, %</td>
<td>10</td>
<td>8</td>
<td>&lt; .001</td>
</tr>
<tr>
<td>Gestational age, %</td>
<td>39.3</td>
<td>38.6</td>
<td>&lt; .001</td>
</tr>
<tr>
<td>Delivery mode, %</td>
<td>3.1</td>
<td>3.5</td>
<td>&lt; .001</td>
</tr>
<tr>
<td>Mean ± SD</td>
<td>2.5</td>
<td>2.8</td>
<td>&lt; .001</td>
</tr>
<tr>
<td>Rate, %</td>
<td>80</td>
<td>80</td>
<td>&lt; .001</td>
</tr>
<tr>
<td>Spontaneous ROM prior to admission</td>
<td>16.0</td>
<td>41.0</td>
<td>&lt; .001</td>
</tr>
</tbody>
</table>


---

**All things considered, What now?**
OMG…after all this time, is Friedman wrong?
Given how long “normal” labor can be, are there guidelines to help us correct or reverse the rising cesarean trend—specifically as it relates to NTSV rate?

The objectives of the study
— Null Hypothesis: For NTSV patients, spontaneous labor, there is no difference between Friedman’s curve and Zhang’s curve
  - Friedman focused on maximum slope as onset of active labor
  - Zhang implied longer time latent phase (6 cm active labor)

Methods
- Retrospective chart review, CSMC
- September 1, 2011- August 30, 2012
- Cohort of women; NTSV
- Demographics/ Clinical variables

Primary Outcome:
—Labor curve for NTSV women, spontaneous labor, vaginal deliveries
  - Friedman
  - Zhang et al (CSL)
  - Lau et al (best fit model derived by statistician described as “% change”)
Demographics of the Spontaneous Labor Group

6,500 deliveries at CSMC  
2561 NTSV; 551 women in spontaneous labor

<table>
<thead>
<tr>
<th>N=551</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>32.1 ± 5.2</td>
</tr>
<tr>
<td>BMI (admission)</td>
<td>27.8 ± 8.6</td>
</tr>
<tr>
<td>Bishop</td>
<td>9.9 ± 2.3</td>
</tr>
<tr>
<td>Gestational Age (weeks)</td>
<td>39.6 ± 1.0</td>
</tr>
<tr>
<td>Cervical Dilation on admission (cm)</td>
<td>4.5 ± 2.5</td>
</tr>
<tr>
<td>Cervical Effacement on admission (%)</td>
<td>85.9 ± 5.1</td>
</tr>
<tr>
<td>Birthweight (grams)</td>
<td>3306.7 ± 6.2</td>
</tr>
</tbody>
</table>

Comparison of the three models

![Comparison of the three models](image)

Model Fit Statistics

<table>
<thead>
<tr>
<th>Friedman</th>
<th>Zhang</th>
<th>% change</th>
</tr>
</thead>
<tbody>
<tr>
<td>R²</td>
<td>59.6</td>
<td>59.1</td>
</tr>
<tr>
<td>Root mean square</td>
<td>2.05</td>
<td>2.07</td>
</tr>
</tbody>
</table>

Essentially, the models are not all that different
Conclusions

- Findings support the null hypothesis
- No difference between Friedman or Zhang or our % change model
- Agree with Zhang
  —need to re-conceptualize how “long” is “normal labor”
  —how “long” it can take to change 1 cm depending on exam on admission

Statistical curves designed to “fit” the data
- Very similar, lots of overlap
- Make some management suggestions
  —Wait longer
  —Admit later

Examining indications for Primary Cesarean Delivery

<table>
<thead>
<tr>
<th>Stage</th>
<th>Indication</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prelabor</td>
<td>Malpresentation</td>
<td>10-15*</td>
</tr>
<tr>
<td></td>
<td>Multiple gestation</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Hypertensive disorders</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Macrosomia</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Maternal request</td>
<td>2-8</td>
</tr>
<tr>
<td>In labor</td>
<td>First-stage arrest</td>
<td>15-30*</td>
</tr>
<tr>
<td></td>
<td>Second-stage arrest</td>
<td>10-25</td>
</tr>
<tr>
<td></td>
<td>Failed induction</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>Nonreassuring fetal heart rate</td>
<td>10</td>
</tr>
</tbody>
</table>


How low can we go?

- “Preventing the first cesarean delivery”
  —Workshop held jointly by NICHD and ACOG in 2012
How low can we go?

- Dramatic rise in cesarean deliveries since 1995
  — Attributable mostly to an increase in primary cesarean deliveries
- Prompted a review of the available information regarding factors leading to the first cesarean delivery

Labor Management

- Antepartum and intrapartum management decisions have a profound effect on the patient’s likelihood of cesarean delivery
- Diagnosis of failed induction and arrest disorders

Labor Management

- Definition of Failed Induction of Labor
- Failure to generate regular contractions (every 3 min) AND cervical change after at least 24 hours of oxytocin WITH artificial rupture of membranes (if feasible)

Definition of First Stage Arrest

- 6 cm or greater WITH membrane rupture and no cervical change for
  a) 4 hr or more with adequate contractions (>200 Mv units)
  b) 6 hr or more if inadequate contractions
**Labor Management**

- **Definition of Second Stage Arrest**
  - No progress (descent OR rotation) for
  - a) Nullips:
    - 4 hrs or more with epidural
    - 3 hrs or more without epidural
  - b) Multips:
    - 3 hrs or more with epidural
    - 2 hrs or more without epidural

  Spong et al Obstet Gynecol 2012

---

**Other Factors**

- Patient and physician attitudes and perceptions
  - Cesarean delivery is relatively safe
  - Committee recommended discussion of the short-term and long-term risks as well as benefits of cesarean vs vaginal delivery

---

**Risk of Adverse Maternal and Neonatal Outcomes by Mode of Delivery**

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Risk</th>
<th>Cesarean Delivery</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maternal</td>
<td>Vaginal Delivery</td>
<td>Cesarean Delivery</td>
</tr>
<tr>
<td>Overall severe morbidity and mortality</td>
<td>0.9%</td>
<td>2.7%</td>
</tr>
<tr>
<td>Maternal mortality</td>
<td>3.6:100,000</td>
<td>13.3:100,000</td>
</tr>
<tr>
<td>Placental abnormalities</td>
<td>Increased with prior cesarean delivery versus vaginal delivery, and risk continues to increase with each subsequent cesarean delivery</td>
<td></td>
</tr>
<tr>
<td>Neonatal</td>
<td>NA</td>
<td>1.0-2.0%</td>
</tr>
<tr>
<td>Laceration</td>
<td>&lt;1.0%</td>
<td>1.0-4.0% (without labor)</td>
</tr>
<tr>
<td>Respiratory morbidity</td>
<td>&lt;1.0%</td>
<td>1.0-4.0%</td>
</tr>
</tbody>
</table>

Gregory et al, 2011

---

**Other Factors**

- Committee recommended monitoring and providing physician level feedback regarding non-indicated primary cesarean deliveries
**Labor Management Styles**

- Wide variation in cesarean rates among providers likely due to diverse management styles
- EX: Admission in latent labor (cervix < 3 cm dilated)
  - Early admission itself increases the risk for cesarean
  - Women requiring earlier admission have an increased risk of abnormal labor
  - Early admission may give the impression of a long, protracted course, and need to “do something”
  - Recall: Normal labor can be 31 hours

**Induction of Labor**

- Likelihood of a vaginal delivery is lower after labor induction compared to spontaneous labor
  - Nulliparous patients
  - Unfavorable cervix
- Committee recommended to avoid labor induction with an unfavorable cervix unless there is a clear maternal or fetal indication for delivery

**Induction of Labor**

- Committee recommended allow adequate time to enter into or progress in labor
- Prudent use of labor induction
- Use of well-defined criteria should be met prior to cesarean delivery
  - Failure of induction
  - Failure to progress

**Primary Cesarean Rates—How Low Can We Go?**

- Objective:
  - Describe the potential reduction in the NTSV cesarean rate in our own population if we applied the principles outlined in Spong et al.

Lau GW, El Ibrahim S, Li G, Kilpatrick S, Gregory KD
Unpublished data
Primary Cesarean Rates—How Low Can We Go?

- Chart audit evaluating indications for cesarean delivery
- Applied Spong et al criteria for failed induction, and arrest disorders

Results

- 2561 NTSV patients/686 cesarean deliveries (26.8%)
  - 40 were indicated—assumed unavoidable:
    - Malpresentation
    - HSV
    - Previa
    - History of prior uterine surgery
  - 45 were patient choice—not addressed by committee
  - 160 (6.3%) did not meet criteria for arrest disorders
  - Theoretical risk reduction of 6.3% would yield potential cesarean rate 20.5%

Theoretical Reduction in Cesarean Delivery Rate

<table>
<thead>
<tr>
<th>Theoretical Risk Reduction</th>
<th>0.60%</th>
<th>1.20%</th>
<th>1.90%</th>
<th>2.50%</th>
<th>3.10%</th>
<th>3.80%</th>
<th>4.40%</th>
<th>5.00%</th>
<th>5.60%</th>
<th>6.30%</th>
</tr>
</thead>
<tbody>
<tr>
<td>26.80%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CS avoided</td>
<td>16</td>
<td>32</td>
<td>48</td>
<td>64</td>
<td>80</td>
<td>96</td>
<td>112</td>
<td>128</td>
<td>144</td>
<td>160</td>
</tr>
<tr>
<td>Potential CS rate</td>
<td>26.20%</td>
<td>25.60%</td>
<td>24.90%</td>
<td>24.30%</td>
<td>23.70%</td>
<td>23.00%</td>
<td>22.40%</td>
<td>21.80%</td>
<td>21.20%</td>
<td>20.50%</td>
</tr>
</tbody>
</table>
Healthy People Goal 2020:

- 2000
  - Healthy people work group NTSV goal 12 percent
- 2010
  - When it was clear these goals would not be met, ACOG task force adopted the 25th percentile for primary cesarean section rate as its goal: 15.5%
- Healthy people goal 2020: MICH-7.1
  - Reduce cesarean births among low-risk women with no prior cesarean births
  - Goal to reduce the rate by 10%
  - Goal NTSV rate of 23.9%

Nulliparous Term Singleton Vertex Cesarean Rate

Goal: Reduce NTSV rate to 30%
Progress to-date: PDSA Cycles

<table>
<thead>
<tr>
<th>Cycle</th>
<th>Summary</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cycle 1) - Macrosomia</td>
<td>Birth weight used to confirm macrosomia as an indication. We found an acceptable range of error (10-15%) between estimate and actual birth weight.</td>
</tr>
<tr>
<td>Cycle 2) - Failed induction</td>
<td>Audit of 40 charts revealed 50% of patients being induced underwent a cesarean before meeting criteria for active labor (&gt;4cm dilated).</td>
</tr>
<tr>
<td>Cycle 3) - Required Bishop score for induction</td>
<td>18 months of data revealed patients met criteria (physician reported exam consistent with exam on admission)</td>
</tr>
<tr>
<td>Cycle 4) - Fetal distress</td>
<td>76/160 charts identified as Category II or III. Reviewers agreed a cesarean was indicated 38/78 cases (49.4%); 14/36 (39.9%) there was an opportunity to alter the outcome.</td>
</tr>
<tr>
<td>Cycle 5) - Arrest of dilatation</td>
<td>Chart audit revealed an opportunity for improvement in 70% of cases (33/47) where cesarean occurred &lt; 6 cm.</td>
</tr>
<tr>
<td>Cycle 6) - Spontaneous vs. induced labor</td>
<td>Physicians who present in spontaneous labor have a shorter labor curve.</td>
</tr>
<tr>
<td>Cycle 7) - Patient education</td>
<td>The taskforce identified a gap in patient education information and developed tailored brochures encouraging patients to await spontaneous labor.</td>
</tr>
<tr>
<td>Cycle 8) - MD Specific cesarean rates</td>
<td>Reports developed and distributed comparing institutional rate with individual physician rates.</td>
</tr>
</tbody>
</table>

Lessons Learned

- Importance of multidisciplinary team, senior management leadership; key physician opinion leaders
- Multifactorial, multi-prong approach
- Maintaining team interest and enthusiasm easier when actively engaged in a “cycle”
  - Harder to maintain re: sustainability
- Clinical judgment will always play an important role
- Must account for patient specific situations
- Need to improve physician and nursing documentation
- EMR is not a database

Next Steps:

- Continue MD reports biannually
- Get educational materials approved
  - Labor & Childbirth (aka When to come to the hospital)
  - Risks and Benefits of Cesarean Delivery
- Data analysis on “6 is the new 4”
- Repeat cycle (how well are we doing?)
- Focus: Induction of labor on women with low bishop scores
  - Look at opportunities for outpatient cervical ripening
- Look at increasing the CSMC VBAC rate
- Standardize oxytocin and reduce tachysystole

Closing remarks

- Trend of increasing cesarean deliveries in low risk NTSV patients is concerning
- Concerted active effort, reversible
- Big Brother is watching…Consumer Reports (May 2014)
- “C-section rates among the hospitals we looked at ranged from a low of 4 percent to a high of 57 percent. ...Read our article on unnecessary C-sections (go to www.consumerreports.org/cro/csections0514.htm) and our technical report on how we rate hospitals (go to www.consumerreports.org/howwerratehospitals)”
Closing remarks

- Significant decreases in the NTSV cesarean rates may be possible with critical evaluation of the management of labor
  — Re-evaluating our assessment of the progression of labor:
    - Friedman Curve (1950s)
    - The partographs (Philpot and Castle, WHO) (1970s-1990s)
    - Zhang (2000s)
  - Regardless of the curve, normal labor can take a long time!
  - Readjust patient and provider expectations
  — One size does not fit all; Individualized labor curves

Closing Remarks

- Re-evaluation of the management of labor in NTSV patients:
  — Reducing elective inductions with an unfavorable cervix
  — Reducing admissions in early/latent labor
  — Applying strict criteria in the diagnosis of the following:
    - Failed induction
    - Latent phase arrest disorders
    - Active phase arrest disorders
    - Arrest of descent
  - Patient and provider attitudes and expectations
    — about the length of labor
    — And avoid primary elective cesarean deliveries

Ultimate weapon to reduce cesarean delivery...

Motherhood made a man out of me...

Cedars-Sinai
Thank You!

Questions?
References